DOI: https://doi.org/10.53350/pjmhs22165683

ORIGINAL ARTICLE

"Comparison of Active Release Technique and Post Isometric Relaxation in Patients with Piriformis Syndrome"

ATTIQ UR REHMAN[1], LAL GUL KHAN[2], MARIA KHALID[3], USMAN MUMTAZ[4], HUMA AKHTAR[5], AYESHA GONDAL[6], SADAF WARIS[7]
[1]DPT, MS-PT (OMPT) Head Practitioner Physical Therapist at Shifa International Hospital, Islamabad
[2]BSPT, MscPT Senior Lecturer at Faculty of Rehabilitation and Allied Health Sciences, Riphah International University, Islamabad
[3]BSPT, PP-DPT, MS-OMPT Assistant Professor at Faculty of Rehabilitation and Allied Health Sciences, Riphah International University, Islamabad
[4]DPT, MS-PT (SPT) Physiotherapist at Bahria College Anchorage Special Children School, Islamabad
[5]DPT, MS-PT (OMPT) Department of Physical Therapy, University of management and technology, Sialkot Campus
[6]DPT, MS-PT (WHPT) Physical Therapist at Care Plus Medical Center G8 Markaz, Islamabad
[7]Senior Lecturer Avicenna Medical and Dental College, Lahore
Corresponding author: Sadaf Waris, Email: dr.sadaf54@gmail.com, Cell: 03088112501

ABSTRACT

Objective: To compare the effects of active release technique and post isometric relaxation on pain intensity, hip internal rotation and functional disability in patients with piriformis syndrome.

Methodology: A randomized clinical trial extending from September 2020 to January 2021 was conducted at Shifa International Hospital, Islamabad. Thirty patients were included in the study using purposive sampling and were randomized through sealed envelope method. All patients were evaluated using visual analogue scale, goniometer and lower extremity functional scale. A self-structured questionnaire was designed for data collection. Two sessions per week were given for three consecutive weeks and a follow up after one month. Data was taken at baseline, after three weeks and after one month follow up. Data was analyzed using SPSS-20.

Results: 30 patients were treated with mean age of 41.30±4.99. 17 females and 13 males were treated. Group A (active release technique) and Group B (post isometric relaxation) showed significant improvement within groups ($P<0.05$) in all outcome measures (VAS, Goniometer and LEFS). Intra group analysis after one month follow up showed no statistically significant difference in VAS and Goniometer ($P>0.05$). However, active release technique was found to be more effective in improving functional disability than post isometric relaxation ($P<0.05$).

Conclusion: Inter group analysis showed that ART and PIR are equally effective in improving pain, hip internal rotation and functional disability. Intra group analysis showed that ART compared to PIR is more effective in improving functional disability in piriformis syndrome.

Keywords: Active Release Technique, Lower Extremity Function Scale, Post Isometric Relaxation, Range of Motion, Visual Analogue Scale.

INTRODUCTION

The prevalence of piriformis syndrome among chronic low back pain patients is said to be 17.2%. It varies widely between 6% and 36% depending on the diagnostic criteria used and characteristic of the sample population(1). It is most frequently found in patients who belong to middle age(2). Prolong or extreme contraction of piriformis muscle results in piriformis syndrome. Impingement of sciatic nerve around piriformis muscle is a non-discogenic cause of sciatica. Piriformis syndrome causes pain in hip and lower extremity because of its close proximity to sciatic nerve(3). Piriformis syndrome is of two types: primary and secondary. Primary piriformis syndrome has some anatomic origin mainly because of a split piriformis muscle, split sciatic nerve or variation in path of sciatic nerve. Less than 15% cases of piriformis syndrome have primary causes. Secondary piriformis syndrome happens as a result of extrinsic factors such as macro or micro trauma. Macro-trauma to the buttocks sometimes leads to the inflammation of soft tissue, piriformis muscle spasm or both resulting in increased compression on sciatic nerve. Micro-trauma results from overuse of the piriformis muscle as in case of long distance running or walking or sometimes by direct compression. "Wallet neuritis" is an example of direct compression(4, 5). A change in hip position results in the change in role of piriformis muscle. It acts as external rotator of hip when the hip is extended. It acts as abductor when the hip is flexed(6). Following specific disorders may result in piriformis syndrome: 1) trigger points within the taut band of piriformis muscle producing myofascial pain 2) piriformis entrapment of the surrounding muscles, nerves and vessels at the great sciatic foramen 3) Sacroiliac joint dysfunction(7). Myofascial pain syndrome is well known in the piriformis muscle. The pain radiates to the posterior ipsilateral leg. An individual with piriformis syndrome quite often feel pain in the buttock and the pain stretches upto the knee and sometimes below knee which is a typical sign of sciatica. Hip adduction with internal rotation cause lengthening of piriformis which aggravates buttock pain or sciatica(8). Although unable to sit for prolong period of time is the classical characteristic of the syndrome(9). Up to 92 percent of the time, piriformis is tender to palpation and so it can be differentially diagnosed from nonspecific buttock pain. Posterior to the hip joint around greater sciatic foramen, piriformis muscle belly can be palpated(10). Piriformis syndrome management includes surgical and non-surgical management. Surgical management includes piriformis muscle release and decompression of sciatic nerve(11). Non-surgical management includes physiotherapy, lifestyle modification, pharmacological agents (non-steroidal anti-inflammatory agents, muscle relaxants, and neuropathic pain medication)(12) and psychotherapy(3). Physiotherapy management for piriformis syndrome includes application of heat therapy, therapeutic ultrasound, METs, neural mobilization techniques, correction of abnormal posture, strengthening of hip musculature, core training in combination with piriformis muscle stretching. As the key issue of the patient is pain and spasm period, all attempts are being made to alleviate the distress of patients by using the most comfortable and psychosomatically appropriate therapeutics such as MET, hot packs and stretching. The Active Release Technique (ART) is a manual therapy technique in which tender point in a shortened muscle position is targeted by high intense pressure, and then the patient is asked to move the leg in opposite lengthened position. This breaks the bonds and restore the texture, elasticity and soft tissue function(13). Muscle energy technique (MET) is a dynamic approach to muscle based therapy that involves the voluntary contraction in a precisely regulated direction of the muscle(s) of a subject against a counter-force provided by the therapist. It follows neuro-physiological rules that states that the muscle get relaxed after it is being contracted(14). This gentle lengthening technique is classically used on muscles which maintain posture. These muscles have the tendency to become tight and short(15). Rationale of the study is that piriformis syndrome is most often misdiagnosed and not enough literature is available on evaluating the effects of active release technique and post isometric relaxation. The present study can be helpful in managing pain,

joint mobility and functional disability of lower extremity in piriformis syndrome.

METHODOLOGY

The current randomized clinical trial was conducted at Shifa International Hospital, Islamabad from September 2020 to January 2021. The calculated sample size was 26 but 33 patients were recruited in current study. 3 patients dropped out. Non probability purposive sampling technique was used and patients were randomized into two groups through sealed envelope method of 15 patients in each group. Inclusion criteria was: age in between 35 to 55 years, both genders, chronic hip/gluteal pain, tenderness to palpation over the sciatic foramen, positive FABER and FAIR test. Exclusion criteria was: malignancies, history of steroid therapy, pain medications/ muscle relaxants, rheumatoid arthritis/osteoarthritis, avascular necrosis of femoral head, osteoporosis, fracture of femur and hip joint dislocation(16). Tools and outcomes of study were visual analogue scale, goniometer and lower extremity functional scale. The total treatment time was 3 weeks with 2 sessions per week making a total of 6 sessions. Outcome measures were evaluated at baseline, after 3 weeks, then follow up after 1 month. Group A and Group B received conventional treatment like moist hot pack applied over gluteal region for 15 minutes. Piriformis muscle was stretched with 30 seconds hold and 3 repetitions were done. Hip abductor strengthening was done in side lying, 10 repetitions per set and 3 sets were done. Patients in group A received Active release technique. Patients in Group B received post isometric relaxation. Total duration of session was 40 minutes. SPSS-20 was used to analyze the data.

RESULTS

A total of 30 patients were randomly divided into two groups, 15 each. Mean age of group A was 41.66±5.55. Mean age of group B was 40.93±4.54. 17 females and 13 males were recruited in this study. Total 9 females and 6 males were included in group A. 8 females and 7 males were included in group B. With regard to occupation, 2 patients were jobless, 11 were house wives, 8 were office workers, 7 were field workers and 2 were athletes. The calculated sample size was 26 but 33 patients were recruited in current study. This was done to avoid any massive drop out because of COVID 19 pandemic. Three patients dropped out. One patient was diagnosed as COVID positive, second patient had financial issues and the third one did not visit for follow up after one month. So 30 patients were treated with minimum age 35 and maximum age 52. Patients were equally divided into two groups (group A & group B). Groups were randomly allocated to the patients by sealed envelope method. Each group contained 15 number of patients. 17 females and 13 males were recruited in this study. Normality analysis was carried out by Shapiro-wilk test which showed two out of three parameters i.e., VAS and hip internal rotation ROM were non normal distribution having ($p<0.05$) so non-parametric tests were applied and one parameter i.e., LEFS was normal in distribution having ($p>0.05$). Within group analysis was carried out by Friedman (non-parametric test) for non-normal parameters and Repeated measure Anova (parametric test) for normal parameters. Between group analysis was carried out by Mann Whitney U test (non-parametric) test for non-normal parameters and Independent T test (parametric) test for normal parameters. Inter group analysis showed both ART and PIR were significantly effective on non-normal parameters, VAS and hip internal rotation ROM (p-value<0.05) as well as on parametric parameter lower extremity functional scale (p-value<0.05). Intra group comparison showed that ART and PIR were non-significant on non-normal parameters. VAS and hip internal rotation (p-value>0.05) while ART produced significant results in parametric parameter i.e. LEFS (p-value<0.05).

Table 1: Demographic Data

Variable		Group A	Group B
Age (years) Mean±SD		41.66±5.55	40.93±4.54
Gender	Male	6	7
	Female	9	8

Table 2: Mann Whitney U Test Non-Parametric Intra Group Analysis for VAS and Hip Internal Rotation ROM

Variables	Mean Rank		Median (IQR)	P-value
	Group A	Group B		
Pain at baseline	15.93	15.07	7 (1)	.766
Pain after 3 weeks	16.90	14.10	3 (1)	.347
Pain after one month follow up	15	16	2 (1)	.695
Hip Internal Rotation at baseline	14.87	16.13	31(2)	0.689
Hip Internal Rotation after 3 weeks	15.7	15.3	35(1)	0.900
Hip Internal Rotation after one month follow up	13.4	17.6	38(2)	0.179

Table 3: Independent t Test Parametric-Intra Group Analysis for LEFS

Variables	Groups	Mean± SD	P- Value
LEFS at baseline	A	34.4±3.64	.047
	B	37.46±4.47	
LEFS after 3 weeks	A	59.86±3.7	.012
	B	63.4±3.48	
LEFS after one month follow up	A	65.86±2.16	0.049
	B	67.4±1.91	

DISCUSSION

This current study compared the effects of ART and PIR in patients suffering from piriformis syndrome which has little evidence available so far. Patients in both of the groups showed significant improvements after treatment in VAS, hip internal rotation ROM and LEFS. This is similar with the findings of other studies which indicated that ART and PIR are effective in reduction of pain severity, increased ROM and improved functional disability in patients with musculoskeletal disorders such as piriformis syndrome(14, 17, 18). However, group A in which ART was applied showed better results in improving functional disability. Piriformis syndrome was found more prevalent in housewives and office workers in current study. This might be because of poor posture, cross legged and prolonged sitting habits imposing exorbitant stress on deep gluteal structures specially on piriformis. Junaid Mujawar et al (2019) compared the immediate effects between neuromuscular therapy, ART and stretching among 42 healthy subjects with piriformis tightness. The age group was 18-25 years. Outcome measures for piriformis tightness included VAS for pain severity, Oswestry disability index and hip internal rotation. It was concluded that both neuromuscular therapy and ART were equally effective than stretching (17). Sajin Tak et al in 2013 analyzed the effects of active release technique for chronic low back pain on gluteus Medius in 12 patients. Two sessions were given for consecutive 3 weeks with ART applied on gluteus Medius trigger points. Outcome measures were pain and pressure pain threshold on gluteus Medius. It was concluded that ART was effective in reducing lower back pain(18). Similarly in the current study marked improvement in pain and functional disability was noticed. All patients reported significant improvements in pain, joint ROM and functional disability. This might be because of the fact that in ART, therapist directly places pressure on taut band of piriformis and is better lengthened in this way. This shows the potential for ART to be an effective treatment for piriformis syndrome. A study conducted by Nambi and Dusad (2018) compared post isometric relaxation and reciprocal inhibition. Random allocation was done to divide the 64 subjects into 3groups. In 2 weeks' time; 12 sessions were given. Outcome measures included in the study were pain severity, hip ROM and functional disability which were measured at baseline and at the end of two weeks. They proposed that

strengthening the hip muscles through PIR helps in correction of altered movement pattern resulting in minimized stress on piriformis muscle. This decreases the compression on sciatic nerve. It was concluded that post isometric relaxation is more effective in treating piriformis syndrome than reciprocal inhibition and proposed to follow further in chronic piriformis syndrome(16). The current study also suggests that PIR reduces the stress on sciatic nerve as a result of reduced tightness of piriformis. The reduction in tightness happens as a result of reflex-relaxation of the muscle after an isometric contraction period. This improves the range of motion of hip markedly and improved hip internal rotation was seen in current study. Birupakshya Mahakul (2010) compared post isometric relaxation with stretching on piriformis syndrome in 30 subjects with back pain. Patients were allocated to two groups. Both of the groups received 10 sessions consecutively. The outcome measures were pain, ROM and disability level and concluded that PIR technique group significantly improved in all outcome measures (14). The current study also showed marked improvement in pain. This is because of the fact that application of post isometric relaxation technique causes loading of Golgi tendon organ which inhibits alpha motor neuron. This further leads to relaxation and significantly increases length of muscle. Significant long-term effects of PIR on pain intensity were seen in the current study.

CONCLUSION

Inter group analysis showed that ART and PIR are equally effective in improving pain, hip internal rotation and functional disability. Intra group analysis showed that ART compared to PIR is more effective in improving functional disability in piriformis syndrome. Limitations of the study are that the results of the current study cannot be generalized due to smaller sample size and due to COVID pandemic data could not be collected from multiple clinical settings. Recommendations for future studies are that the long term effects of ART on a larger scale should be studied so that the results can be generalized, data should be collected from different clinical setups, patients of multiple age groups should be studied to evaluate the effects of ART in all age groups. Additional studies should be conducted with similar treatment along-with advanced technological and radiological considerations in individuals with piriformis syndrome.

REFERENCES

1. Kean Chen C, Nizar AJ. Prevalence of piriformis syndrome in chronic low back pain patients. A clinical diagnosis with modified FAIR test. Pain Practice. 2013;13(4):276-81.
2. Siddiq MAB, Hossain MS, Uddin MM, Jahan I, Khasru MR, Haider NM, et al. Piriformis syndrome: a case series of 31 Bangladeshi people with literature review. European Journal of Orthopaedic Surgery & Traumatology. 2017;27(2):193-203.
3. Jankovic D, Peng P, van Zundert A. Brief review: piriformis syndrome: etiology, diagnosis, and management. Canadian Journal of Anesthesia/Journal canadien d'anesthésie. 2013;60(10):1003-12.
4. Boyajian-O'Neill LA, McClain RL, Coleman MK, Thomas PP. Diagnosis and management of piriformis syndrome: an osteopathic approach. The Journal of the American Osteopathic Association. 2008;108(11):657-64.
5. Velappanchavadi C. Effectiveness of muscle energy technique versus stretching in subjects with piriformis syndrome. Int J Physiother Res. 2019;7(5):3252-56.
6. Michel F, Decavel P, Toussirot E, Tatu L, Aleton E, Monnier G, et al. The piriformis muscle syndrome: an exploration of anatomical context, pathophysiological hypotheses and diagnostic criteria. Annals of physical and rehabilitation medicine. 2013;56(4):300-11.
7. Hicks BL, Varacallo M. Piriformis syndrome. 2017.
8. Probst D, Stout A, Hunt D. Piriformis syndrome: a narrative review of the anatomy, diagnosis, and treatment. PM&R. 2019;11:S54-S63.
9. Foster MR. Piriformis syndrome. Orthopedics. 2002;25(8):821-5.
10. Byrd JT. Piriformis syndrome. Operative Techniques in Sports Medicine. 2005;13(1):71-9.
11. Han SK, Kim YS, Kim TH, Kang SH. Surgical treatment of piriformis syndrome. Clinics in orthopedic surgery. 2017;9(2):136-44.
12. Dworkin RH, O'connor AB, Backonja M, Farrar JT, Finnerup NB, Jensen TS, et al. Pharmacologic management of neuropathic pain: evidence-based recommendations. Pain. 2007;132(3):237-51.
13. Kage V, Ratnam R. Immediate effect of active release technique versus mulligan bent leg raise in subjects with hamstring tightness: a randomized clinical trial. Int J Physiother Res. 2014;2(1):301-4.
14. Mahakul B. Effectiveness Of Post Isometric Relaxation Technique And Stretching In Functional Outcome On Piriformis Syndrome: A Randomized Experimental Study 2010.
15. El Laithy M, Fouda K. Effect of post isometric relaxation technique in the treatment of mechanical neck pain. Physical Therapy and Rehabilitation. 2018;5(1):20.
16. Bose GNSC, Dusad G. Effect Of Reciprocal Inhibition And Post Isometric Relaxation; Types Of Muscle Energy Technique In Piriformis Syndrome–A Comparative Study. European Journal of Pharmaceutical and Medical Research. 2018.
17. Mujawar JC, Chotai K, Kanase S, Jadhav A. Effectiveness of Neuromuscular Therapy and Active Release Technique in Young Adults with Piriformis Tightness. Indian Journal of Physiotherapy & Occupational Therapy. 2019;13(4):212-7.
18. Tak S, Lee Y, Choi W, Lee G. The effects of active release technique on the gluteus medius for pain relief in persons with chronic low back pain. Physical Therapy Rehabilitation Science. 2013;2(1):27-30.